Mecheleciv

VOL. 15 NO. 4

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SCHOOL OF ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

MARCH 1956

James Chisholm, class of '41,
speaks from experience when he says,

"Men with ability and ambition really have a chance to get ahead at U.S. Steel"

● A responsible position can come quickly to those graduate engineers at U.S. Steel who show ability and ambition. Management training programs are designed to stimulate and develop these qualities as the trainee "learns by doing." His training is always a fascinating challenge and he works with the best equipment and the finest people in the business.

James Chisholm is typical of the young men who rapidly rise to an important position at U.S. Steel. Jim came to U.S. Steel as a trainee in 1941 after graduating as an M.E. Shortly thereafter he entered military service for four years. Upon his return to U.S. Steel in 1946, he advanced steadily until, in 1951, he was appointed to his present position as Assistant Superintendent of Blast Furnaces at the new Fairless Works at Morrisville, Pa.

Jim is now in charge of quality control for open hearth furnaces at Fairless, the unloading of all ore ships and the operation of the plant's two big blast furnaces—each with a rated output of 1500 tons per day.

Jim feels that the opportunities for graduate engineers are exceptional at U.S. Steel. He remarked that in his own department alone, six college trainees have been put into management positions within the last couple of years. He says that chances for advancement are even better now with the current expansion of facilities and the development of new products and markets.

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The Mecheleciv

VOL. 15 MARCH 1956 NO. 4

SCHOOL OF ENGINEERING, THE GEORGE WASHINGTON UNIVERSITY

IN THIS ISSUE

DEPARTMENTS

ON OUR COVER

Capital Airlines is justly proud of its brand-new Vickers Viscounts, the first turboprop aircraft to appear in commercial service. Full details on the Viscount begin on page 8.

Photo courtesy of Capital Airlines
Cover by Lenore Alexander

FRONTISPIECE

This steel sphere which all but dominates the countryside around West Milton, N.Y. is the housing for the world's first commercial atomic electric power. Inside the 200-foot diameter ball is a prototype reactor for the Navy's submarine "Seawolf." Excess power is used to turn a generator.

Photo courtesy of General Electric

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EDITORIAL:

Ear to the Ground and Nose in the Air

Along about this time of the publishing year, MECHELECIV gets a glimpse of student and alumni opinion of itself. In attempting to sift out the honest-to-goodness comments from the caustic ones, MECHELECIV has come up with some disturbing criticismc of its editorial content. The general train of thinking in criticizing is that there are not enough articles of the right type, or that there are too many articles of certain other types.

Realizing that the best defense is to attack, MECHELECIV justly does so with the old refrain of engineering writing. Why won't the engineer write? Why is the engineer a literary sealed box? These, and many other questions are constantly thorns in the sides of our engineering educators as well as the editorial staffs of engineering magazines. To the educators, it may mean that their products are technically proficient as possible, yet as uncommunicative as one-celled amoeba. Their solution lies in more and better English courses, along with the humanities to give the engineer the necessary writing tools and a slight subjective insight for using them. To the editorial staff of engineering magazines, such as MECHELECIV, it means having to dredge articles out of the student body, or write them themselves. If a magazine should select an elite group of writers, and use them exclusively, it would soon become an editorial dead-end.

The usual process for obtaining articles is to buttonhole a student with an idea and convince him that he should write. This plan is not altogether good, for it yields about ten percent results; writing is just too painful a process for most engineering students. It seems to be a common opinion that an article would be useless, because no one would be interested in reading it. Judging from the siftings of opinion, nothing could be further from the truth. MECHELECIV, like its forty-two fellow magazines of the E. C. M. A., is in a unique position to serve as an outlet for out-of-classroom creative talent among engineering students.

Ideally, there should be a vast surplus of articles and would - be writers queuing up to await publication. In the past few years, there has been an increasing awareness on the part of engineering students that they do need to write, and that practice in writing is an essential tool in the engineer's kit. The day may come to pass when the engineer will communicate, and will let his ideas be known through the medium of the written word. We hope so.

FACULTY PAGE

IS E.C.P.D. ON THE BALL ?

By Prof. Benjamin Cruickshanks
Executive Head, M. E. Department

Engineers Council for Professional Development was set up as a sort of unifying influence for a profession that is more divided than perhaps any other group. One duty of the Council has been to accredit our engineering schools. They examine curricula, courses, faculty, equipment, methods, and financing, all at considerable expense to the schools. Yet their approval is not recognized by the engineering profession itself. Boards of examiners for licensing professional engineers pay no attention to the work of ECPD but require all applicants for "in-training" license to take examinations.

Attention is here directed to these examinations. Holders of engineering degrees have just finished four or more years satisfying a faculty of specialists (approved by ECPD), yet are immediately subjected to reexamination in the same subjects. This entirely discredits the work of faculties approved by ECPD. Furthermore, the men who conduct these examinations are in many cases inexperienced in the preparation and grading of examinations. We learn of a "recent exam in which 50% of the group failed." Was it the applicants or the board of examiners that failed? An instance is known in which student assistants in a local school did the grading, which of course does nothing to enhance the Board or the profession in the eyes of the young engineer.

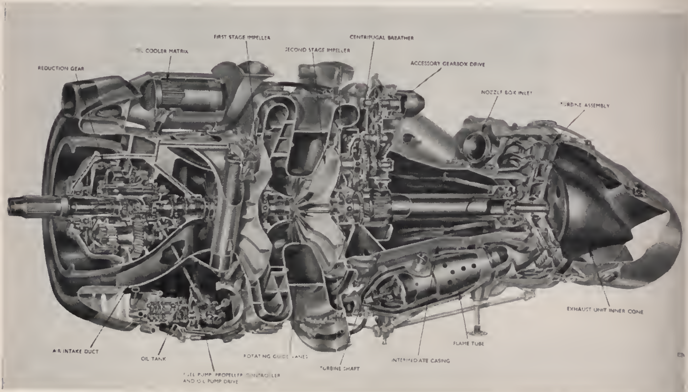
Graduates are urged to take "in-training" examinations immediately while the fundamentals are fresh in mind. This is a good membership "come on" to get them in line and begin paying an annual fee to avoid a subsequent examination. A graduate from an accredited engineering school should be forever exempt from an examination on fundamentals of engineering (except where he has been away from the field for some time). Furthermore, he should not have to register until such time as he feels the need. Most large organizations that employ engineers, including municipal and Federal governments, are not concerned with the matter of registration.

The present generation of engineering students, harassed by final exams, comprehensive exams, graduate record exams, and perhaps civil service exams as well as "in-training" exams, would welcome an investigation of this situation by ECPD with the object of abolishing the needless "in-training" examination.

First Turboprop:

THE VICKERS VISCOUNT

By Mike Brady B. E. E. '56



Cut-away view of the Rolls-Royce Dart Engine.
—Rolls-Royce Drawing.

To the commercial air traveler, accustomed to flight in DC's, Constellations, Convairs, and a host of other familiar craft, the tea and crumpets British name of Vickers Viscount seems a bit strange, if not completely out of place. The name Viscount is new on the scene and the craft itself holds the unique position of being the first turboprop airplane to appear in commercial service.

At first glance, the Viscount seems to violate all the familiar details of commercial aircraft. Its propellers hardly seem large enough to maintain it in flight, and its engine nacelles have no louvers or other indications of engines save for an apparently over-sized exhaust pipe. It sits as close to the ground as many smaller aircraft, and, as a matter of fact, gets off the ground as quickly. Behind this unfamiliar appearance is the now familiar jet-type engine. Yet to call the Rolls-Royce Dart engines jets would be almost as wrong as labeling them conventional. In flight, the Viscount seems quite effortless, since the familiar vibration of piston-powered craft is absent; in its place is the feeling of riding across a deep-pile rug on a vacuum-cleaner. To compare the Viscount directly to any other commercial airliner would not do justice to either craft; the Viscount is a specific plane designed for a specific use.

The turboprop engine is particularly suited to medium range operations from the standpoint of speed and economy. From a study of cruising speed figures, the Viscount does not appear to be a super-fast aircraft; some planes now in service top its 320 mph cruising speed. If the Viscount is neither a long-range craft nor a fast one, then what is it? To answer this question, a short study is in order of one of the first American users of the Viscount: Capital Airlines.

CAPITAL'S POSITION

Capital Airlines, with its home base in Washington, D.C., concentrates its operations in the heavily populated section of the country east of the Mississippi River. Capital's operation may be looked upon as being basically short-haul; the longest run is Washington to Chicago. The problem confronting Capital was to provide service equivalent to that of the four-engine transcontinental giants on runs which had for years been monopolized by the two engine DC-3. Apparently a smaller craft was in order, yet such a plane would have to compete in speed with large planes. To use the large craft themselves would have been a losing proposition, for the large planes only are feasible in long-haul service. In short-haul service, the takeoff-to-landing time is important; the short-haul craft must have a fast rate of climb and be able to descend at a sharp attitude to land. To power a small four engine craft with larger engines would not meet the requirement in that running expenses would be prohibitive. Capital's quandary was by no means unique, the same position is shared by many other airlines throughout the world. Capital found the Viscount to meet its need for new aircraft: a medium-sized short-haul plane. The Viscount is, in modern terminology, a medium-sized plane, about the size of a DC-4. It is, however, also a fast plane for short-run operations; its rate of climb and descent is about twice that of a DC-7.

THE ROLLS-ROYCE DART ENGINE

Just as in automobiles, the engine does not completely determine the operation of the machine as a whole. The Viscount is in many ways a unique craft, but its most startling departure from conventional airliners is its method of propulsion: the turboprop engine. The Dart 510 engine would more properly be called a self-driven turbine than a jet; its actual nomenclature is propeller-turbine. Like the jet engine, the Dart takes in air, compresses it, and ignites a mixture of compressed air and kerosene. Unlike the jet, the major part of the energy developed by the ignition is used to drive the turbine, which is used only to drive the compressor and accessories in a jet. The energy which is not expended in driving the turbine is exhausted to provide thrust. At takeoff the propeller develops 1600-HP and the jet 365-lb. of thrust, giving an equivalent of 1740-HP (figures for 700D Viscount).

Just as the cycle of operation of a piston engine may be divided into parts, so may the operation of the Dart. Fundamentally, the Dart "cycle" is little different from that of the straight jet.

(1) Air is drawn into engine through annular intake duct.

(2) Air is compressed in a two-stage centrifugal impeller compressor.

(3) Compressed air then enters seven straight-flow combustion chambers (flame tubes) where it is mixed with low volatile kerosene and ignited.

(4) Ignition energy drives two-stage axial turbine and provides jet thrust out exhaust unit.

The inherent simplicity of the engine is that it has far fewer moving parts than the conventional piston engine. The basic engine has only five moving assemblies: the compressor unit, the turbine unit, the two associated shafts, and the reduction gear unit. Accesories necessary to operate the engine and the plane are driven through an accessory gearbox. The oil and fuel pumps are driven by a takeoff from the main gear unit. The starter unit engages just ahead of the first stage impeller; the gearing being part of the main gear unit. The chief function of the main gear unit is to reduce the high speed of the engine main shaft (14,500-rpm at take off, 13,600-rpm at cruising) to a speed usable by the propellors. The overall reduction, accomplished in two steps is 10.75 to 1.

The two-stage compressor handles about 20 pounds of air a second with a pressure gain of about 5½ times. The two-staged turbine has blades carried on separate wheels by "fir tree" type serrated roots. The turbine drives the compressor directly through a common shaft. Air is tapped off at the compressor to cool both the front and rear faces of the turbine blades.

(*Please turn to page* 20)

VISCOUNT 700D DATA

Wing Span	93 feet 8½ inches	Seating Capacity	40 - 59
Length	81 feet 2 inches	Max. Payload	12,242 pounds
Height	26 feet 9 inches	Still-Air Range with Max. Payload	1,425 statute miles
Max. Take-Off Weight	60,000 pounds		
Max. Landing Weight	54,000 pounds	Max. Still-Air Range	2,190 statute miles 7,600 lb. payload
Empty Weight	35,936 pounds		
Fuel Capacity	1,950 Imp. Gallons	Aevrage Cruising Speed at 13,600 rpm	320 m.p.h.
Engines	4 Rolls-Royce R. Da. 6 Dart Type 510		
Take-Off Power	1,600 S. H. P. plus 365 lb. Jet Thrust 1,740 E.S.H.P.	Fuel Consumption	305 Imp. Gal. per hr.
		Take - Off Distance (1 engine inoperative)	1,550 yards
Gear Ratio	0.093/1	Landing Distance	1,020 yards

The fuel capacity and range may be increased with wing slipper tanks. The take-off and landing distance figures are for maximum loads to and from an airborne height of 50 feet.

Man Made Island:

THE TEXAS TOWER

By JACK BRANDAU, B.M.E. '56

Jack Brandau, although new to these pages, is a familiar figure on the G. W. Engineering campus. Jack is a member of Sigma Tau and A. S. M. E., and recently received the first Mahler Materials Testing Award given at G. W.

In late November 1955, newspapers carried the story of a daring open-sea rescue of 52 men from a huge platform 110 miles off the coast of Massachusetts. The rescued men were official visitors to the structure which is to be used as an early warning radar base. These visitors became semi-permanent guests when a sudden storm, for which the North Atlantic is famous, blew up and made the procedure of transporting the men from the deck of the tower to the deck of a transport tugboat physically impossible. This incident, although disconcerting to the stranded men, served to dramatize the completion of the erection of this tower which is the first of a series that will serve as a permanent picket fence protecting the Northeastern coast of the U. S. from sneak air and sea attack.

The structures providing the living quarters for the crew and the foundation for the electronic equipment are called "Texas Towers" because of their resemblance to the marine oil-drilling stations in the Gulf of Mexico which have been known by that name since their erection. Texas Tower #2 (TT2) although the first to be erected is the second from the southern end of the proposed series of towers.

TT2, like the others, will report information on all unidentified aircraft to the nearest shore-based aircraft control and warning squadron which will "scramble" jet interceptors to identify the unknown planes. In addition, the tower will serve as a weather station. Each tower includes housing facilities for the electronic equipment and for a crew of over 70 Air Force, Navy, Weather, and Coast Guard Personnel, landing space for helicopters, and docking facilities for supply ships. The tower comprises a triangular deck supported by three cylindrical legs and, in the case of TT2, is approximately 350 feet in height from the bedrock to the top of the platform, comparable in height to a 30 story building.

A construction job of such magnitude requires extensive studies of all controlling factors. This includes study of sea and weather conditions, analysis of ocean floor conditions, design problems of the tower, and anticipation of erection problems so that they could be solved in advance of the actual erection.

It was decided to place the towers on the Continental Reef because of the shallow depths. TT2 is at Georges Bank at a depth of 50 feet; however, 2,000 yards seaward the depth drops to 1,000 feet. Actual wave tests indicated that the maximum wave for design purposes would be 60 feet and would be induced by prolonged hurricane winds. The North Atlantic has what is termed a "safe" period, free from hurricane winds and waves. While this period from June to August is mild for that section of the Atlantic, only ten days exixst during this period on which waves under 4 feet can be expected. Ice was no problem here but the various forces which the water and sandy-soil bottom would exert on the tower were of unknown magnitude and behavior.

Early designs showed that the platforms must be above the waves at all times. Basing calculations on the 60-foot waves which would rise about 36 feet above still water level, adding a 6-foot tide, allowing for a possible splash factor and safety factor, the design height above mean water level was 67 feet. At this height a 96 foot wave would just clear the platform.

Ordinary methods of water construction were obviously not feasible for this erection job. It was decided to fabricate the structure ashore, float it to the site and erect it on location with the minimum of floating equipment.

The tower was designed as an equilateral-triangular water-tight hull mounted on three columns. It was desired that a minimum number of supporting columns be used. Three were used because this is the minimum number allowable without cantilevering. The platform was made 20 feet in height with administrative rooms, radomes, hoisting cranes, and a helicopter landing space. The steel supporting columns were made 10 feet in diameter and the steel caissons to be sunk 50 feet down into the sandy bottom were made 15 feet in diameter. All steel surfaces exposed to the tide and spray area were protected from corrosion by a sheet of Monel metal.

For the comfort of the crew and the efficient operation of the electronic equipment, the tower was designed with air conditioning and heating units, electrical generators powered by diesel engines, an evaporator capable of distilling 150 gallons of salt water each hour, and a complete maintenance workshop.

On July 12, 1955, witnesses along the shore near Provincetown, Massachusetts noticed four tugboats pushing and towing a raft-like object with numerous tall columns sticking straight up in the air. TT2 was on its way. The erectors, the Raymond-DeLong Corp., of New York had received the tower from Bethlehem Steel Company and, after loading necessary supplies right on the hull, got started without delay. The 12 temporary legs were then unfastened and allowed to slide down through wells in the hull until they touched bottom. These tem-

porary legs were six feet in diameter and they penetrated into the sand about eight feet. At the point at which each temporary column passed through the hull were two box-like pieces of equipment which were the famous DeLong air jacks, each capable of lifting 300 tons. The action of these jacks might remind an observer of a boy shinnying up a pole. The upper half of the jack does the work of the boy's arms and the lower half corresponds to his legs. Around the inside of each section are tough rubber tubes which are ridged to obtain gripping action and when these tubes are inflated, they grip the column. Between the top and bottom halves is an accordian-like tube which, when inflated, pushes the top and bottom sections apart. The bottom section is fastened to the hull.

sand and water upward and discharged it into the sea. When the platform was almost at the planned height, the sand pump broke down, but the engineers were prepared. They used a clam shell digging bucket on the end of the crane cable to muck out the remaining sand. When the permanent caissons were down on bedrock, the space between the 15 foot shells and the 10 foot columns was filled with concrete and the upper ends of the columns were welded directly to the platform.

After removal of the 12 temporary columns, the biggest part of the tremendous job was finished. As the finishing touches were added such as installing the equipment and stocking the tower with supplies, everyone concerned was grateful to the God of Weather that the North

Texas Tower number 2, in the final stages of construction
—U. S. Air Force Photo.

The lower tube is inflated and it grips. Then the middle tube is inflated and it pushes the top tube up about 6 inches. Then the top tube is inflated, the bottom tube is deflated, and as the middle tube is deflated the lower half moves up to prepare for another six-inch lift.

As soon as the temporaries were all down and steady, the air compressor went to work and the jacks pushed the hull, inch by inch up the temporary legs. Seven hours after jacking had begun, the platform was slightly above the water. Then the three permanent caissons were lowered to the bottom. These were sunk open-ended by interior excavation and by downward jacking, using two DeLong jacks to apply just enough downward pressure to keep the cutting edge of the caisson in firm material. In order to dig the sand away as the column sank, flushing nozzles were lowered into the open caisson and these jetted the sand out. A sand pump then sucked the loose

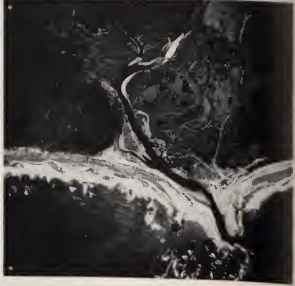
Atlantic had stayed calm during the tedious erection. Soon TT2 was open for business.

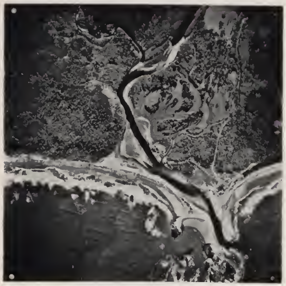
The Navy and Air Force personnel stand a one month tour of duty on the tower after which they are relieved for other duty. Supply ships visit the tower each week and, if the sea is calm enough, they can tie up to the tower. Heavy fenders are lowered to protect the tower's legs from damage.

Soon after construction was completed the Atlantic roared up in hurricane fury and lashed the tower unmercifully. Several times, barges and ships which have been anchored off the tower have crashed into the supporting columns but through all this the tower has stood firm. The builders can well be proud of their job. When the other towers in the chain are completed, the United States will have a far flung phalanx guarding a portion of her shore from enemy invaders.

Hi-Fi

Edited by Ray Sullivan B.E.E., '58





Above: Print made by usual methods showing "burned out" forests and "washed out" beach.

Left: Print made from the same negative by electronic dodging process. The print uses the same grade of paper, yet excels in detail and uniform contrast.

—LogEtronic Engravings

Anyone who has had any experience with photography knows that a tremendous amount of information which is contained on the negative is lost in the printing process. The basic problem arises from the inability of photographic papers to record properly the extreme density (tonal) ranges present in the negative. As a result, in controlling conventional printing, certain regions of the print must be allowed to become too dark or remain too light, or both, in order to transfer the maximum amount of information.

One of the methods of partially compensating for wide ranges in negative density is called "dodging." When "dodging," the person making the print waves a card over the sections of the print which he thinks might get too much light. This and other methods commonly used in an attempt to reproduce an optimum amount of information on the print, are laborious and produce unpredictable results from one negative to the next. Reproducibility therefore is practically impossible. The LogEtronic Contact Printer does this job efficiently and automatically and provides over-all exposure control at the same time.

Briefly, the LogEtronic printer uses a single cathode ray tube as the printing light source, a stationary photocell to sense the light which passes through the negative and the printing paper, plus a feedback loop through which the photocell continuously controls the intensity of the scanning light source. This basic principle while having many applications will be discussed in terms of the contact printer which is shown in schematic form.

The light-projecting pattern on the face of the cathode ray tube is generated by a pair of triangular waves of approximately 120 and 121 cycles per second. The resulting light-projecting area therefore is a square pattern of light which repeats itself at the beat frequency of one cycle per second.

On first consideration it might seem desirable to have as small a spot size as possible so as to reproduce all possible detail. This is specious reasoning, however,

Photography

A MECHELECIV REPORT ON AN ALUMNUS IN LOCAL INDUSTRY

because actually in a system with 100 per cent feedback and an infinitely small spot, all detail would be "dodged" out, leaving a solid grey print. If the spot were some very small finite dimension, sweep lines would be visible in the print. Therefore, the spot is made sufficiently large in the printing plane, approximately ½-inch diameter. so that there is 90-per cent overlap to avoid this effect. This spot size has proven to provide excellent "dodging" resolution.

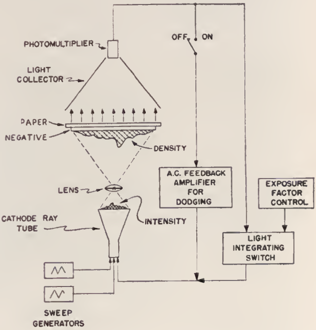
A 5-inch cathode ray tube is used in the current version of the LogEtronic printer. The scanning pattern covers an area of only 3 by 3 inches and must be projected to an area of 10 by 10 inches to cover the largest-size negative the current model is capable of handling. A simple double-convex lens with an f/1 aperture is adequate for the purpose.

Optics of the printing stage are conventional with the negative resting on glass with the printing surface (paper, film, or glass) held on top of it by a spring-loaded clear plastic platen. Thus, light from the face of the cathode ray tube is projected by a simple lens to cover the negative which is held in contact with the printing paper.

Light penetrating the negative, after scattering by the paper, is partially collected and transmitted to the photomultiplier. The output of the photomultiplier is fed back to the cathode ray tube through two independent electronic channels. One channel is an a-c amplifier which performs the dodging operation. The other channel is a light integrating switch which turns the cathode ray tube off when exposure reaches the level established by the exposure factor control. Signals in the dodging channel correspond to the density variation in the negative and are used to modulate the electron beam intensity, and thus light output, of the cathode ray tube. Signal polarity is arranged to produce inverse feedback meaning that when a dense region of negative is encountered by the spot, it instantaneously becomes brighter, the reverse being true for the thin regions. As a result, an unsharp (defocused), positive, luminous image of the density variations in the negative is formed at the face of the cathode ray tube, and then projected back onto the negative. The effect, thereby, is to produce a relatively uniform distribution of light at the photosensitive surface of the printing medium which in turn produces the uniformly exposed, or "dodged" print.

Response in the feedback circuit is fast compared to the rate at which the spot moves across the negative, so that scanning and exposure are simultaneous and in absolute register.

The second feedback channel contains an electronic integrating circuit which continuously totalizes the light which has passed through the printing surface. When the amount of integrated light reaches the preset level (determined by emulsion speed, subsequent processing, and personal taste), an electronic switch biases

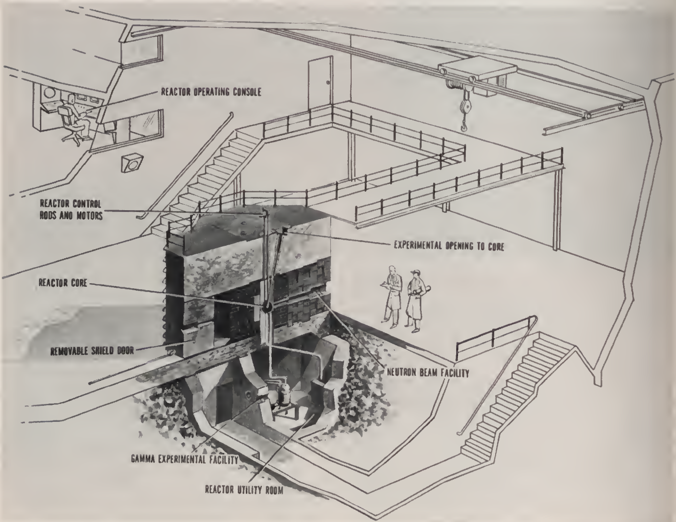


"The LogEtronic Principle"

the cathode ray tube to cut-off which terminates the exposure. Although exposure times may vary from one negative to the next, print exposure levels will be constant since only the light which reaches the emulsion is involved in the integration.

The system described above forms the basis for the LogEtronic printer which produced the comparative print pairs shown in this article. The "conventional" print was made with the switch in the a-c feedback channel turned OFF, thus maintaining constant spot intensity at the cathode ray tube. The LogEtronic print was made with the feedback ON to produce automatic dodging as described previously. In each case, however, the light-integrating switch was kept operative so as to produce the same over-all exposure level for both prints.

(*Please turn to page* 34)



Cutaway drawing of the first nuclear reactor for private industrial research. —North American Drawing

THE CIVILIZED ATOM

By Stuart Riggsby

Last summer the leaders of the principal nations of the world emerged from a series of conferences to announce the coming of age of "The Geneva Spirit" - a new era of friendship and cooperation. Eight weeks later, other representatives of those nations met to read its obituary. From the standpoint of the technical world, though, this "era of cooperation" was not an idle waste of time, for it was instrumental in bringing about an important step forward in nuclear research and reactor development.

The International Conference on the Peaceful Uses of Atomic Energy, held at Geneva last August, may be recorded as the most important gathering of scientists ever held, for the exchange of information and ideas that took place there would have been difficult - perhaps impossible - in any other medium of contact. Since this conference is the latest source of reliable information on the atomic research of other countries, it is only through a study of what was made known there that we may judge the position of the United States. With the Geneva Conference as a starting point, this article will discuss the recent advances in nuclear studies, and some of the problems which still face the engineer and the scientist in reactor research.

A note should be made about the use of the word "recent." It is a fact that if the public knows about a certain phase of atomic research, that work is not, in the usual sense, recent. Indeed, the research in the field of nuclear powered airplanes, announced by the government in January, has been going on for two years! For the purposes of this article, "recent" will be used to mean "rceently made public."

Observers at the Geneva conference were generally left with the impression that the United States has a significant lead over other nations in reactor research. However, the rapid advances of others, principally the Soviet Union, and the nations of the British Commonwealth, indicate that this country must continue to expend a great amount of effort in the field if this lead is to be maintained. And as the structure and behavior of the atom become better and better know, a greater share of this work will fall to American engineers. While it is in many cases only a matter of opinion that separates an engineer's problem from a physicist's or a chemist's problem, it is evident that the engineer—nuclear, electrical, civil, aeronautical, or mechanical—will have a greater and greater part in the expanding field of nuclear industry. His role will become clear as the various problems and their solutions are considered.

As one might infer from the preceding paragraph, the problem of "what" is no longer a great one; the remarkable agreement of results of independent research by theoreticians in many countries in their discussions at Geneva shows that. But the problem of "how" looms large; how does one go about designing and building a reactor for some specific purpose? Each reactor, of course, has a different purpose; hence, the answers to the basic questions must in each case be different. One problem all have in common, and on which many other considerations depend, is that of fuel.

There is but one naturally occuring substance suitable for use as fuel in a nuclear reactor—the uranium isotope, U235. The problem is further complicated by the fact that this isotope is extremely rare, forming only about three-quarters of one per cent of natural uranium. Fortunately, it is possible to make use of certain synthetic materials as fuels; and most of the countries carrying on serious research in nuclear energy have experimented extensively with these artificial fuels. The result of their labor has been the development of two elegant "breeding" systems. These systems differ in the raw material used to create the fuel; one uses U 238 (the other ninety-nine and a quarter per cent of natural uranium); the other uses the element thorium.

The United States has built at the Argonne National Laboratory a power plant that makes use of the U238 process, transforming it into useable fuel, and, *at the same time*, generating fifteen kilowatts or more of electricity. This breeder-generator reactor is an elaborately conceived device, and incorporates not only the abundant isotope of uranium, but a unique coolant as well. The theory behind the process has been known for some time. When a small amount of U235 is used to supply neutrons to the U238 "fuel" the following reactions take place:

A neutron collision with U238 gives U239 plus a gamma particle. The resulting U239 then gives off a beta particle to become PU239 with an additional freed beta particle.. Since the resultant plutonium is a fissile material, effective use of the process may be expected to reduce considerably the cost of production of power in nuclear reactors. The coolant referred to above is liquid sodium. After the sodium is heated by the reactor processes, it passes into a heat exchanger, heats water. and is pumped into a storage tank. The water thus heated is sent to another heat exchanger where it is used to vaporize water in a second system at lower pressure. This steam is used to generate power. (The dual converter is necessary because of the high amount of radioactivity resident in the sodium.) The lower pressures made possible are a further advantage of this system.

The second breeding process, that using thorium as

(*Please turn to page* 30)

OUT OF THE BRIEFCASE

Industry News

INDUSTRIAL TV

A new look at industrial television brings up Dage Television's unique remote control TV system.

Any operation of the TV camera can be achieved by turning a designated knob on the complex separate monitor console. The monitor even has a built-in memory by which up to three different pre-set directions of the camera can be stored.

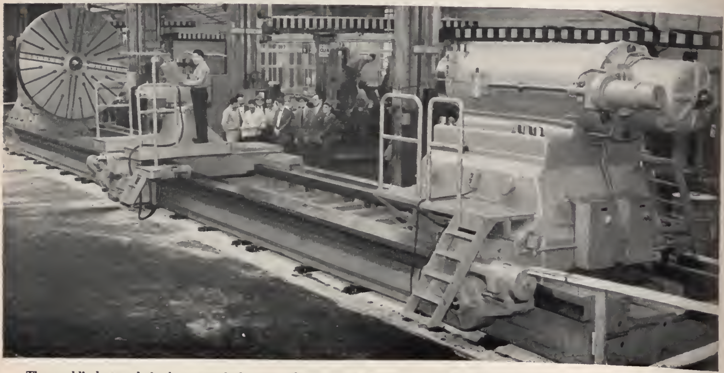
This advancement will promote operator safety in hazardous locations, assure undetected operation in security and surveillance work and permit quick, accurate viewing of widely spaced objectives.

SCIENCE STRESSED

Sound teaching of the physical sciences and mathematics is an essential ingredient for secondary school education of all students. These views were expressed time and again by various industries and also at the White House Conference on Education at the close of 1955.

The rapid technological developments of our time require a knowledge of such fundamental ideas as would be offered by basic courses in the fields of Mathematics and Science. Whether or not the student continues on to college is no criteria for exemption. The nation's colleges and universities are doing their part in keeping astride the times. Illinois Institute of Technology opined that education's leaders were aware of the necessity of providing "educated manpower of adequate quality and quantity" to support the advanced technology.

A recently published volume "Soviet Professional Manpower" shows our ambitious opponent to be a country determined to develop their industry by a highly technical educational system. Their graduates in technical fields are on the increase while in America we suffer from a deficiency in these fields due to the more expansive society in which we live.



The world's largest lathe has recently been installed in General Electric's Large Motor and Generator Department at Schenectady, N. Y. Measuring 55 feet between centers and having a 144-inch swing, the lathe can handle workpieces weighing 400,000 pounds. The machine was built by the Consolidated Machine Tool Corp. of Rochester.

—General Electric Photo

The Impact Guillotine is a new method for testing shock resistance of metals. Samples for the guillotine test are larger and easier to prepare than those used in the familiar Charpy method.

RIAS Set Up

The scientific frontier of man is the development aim of a new research outfit in the Baltimore- Washington area. It is R I A S, Inc. a subsidiary corporation of Martin.

The first projects of RIAS in their theoretical and experimental studies, will be directed toward general relativity and associated theories of gravity, electro-magnetism and possibly sub-atomic particles.

Other area studies may include manned transport of outer space, materials in solid state, fluid dynamics, atomic and sub-atomic particles.

Up to this time basic research has been primarily in university and governmental laboratories.

Job Directory

Unlimited job opportunities for engineering graduates promote the problem of locating the right firm with the right opening.

The 1956 Engineer's Job Directory hopes to solve the problem for graduates and under-graduates, professors, and instructors for summer jobs.

236 major companies are listed and described along with a special engineering and scientific job index and editorial by six experts.

Whether foreign, coastal, or rural locations are desired the EJD pinpoints the firms. The EJD is free to all engineering seniors and may be procured through the University placement office or by writing to:
Decision, Inc.
481 First National Bank Building
Cincinnati 2, Ohio.

MAN-MADE SATELLITE

A man-made statellite will be launched in 1957, the International Geophysical year, as a possible forerunner of solar stepping stones for a rocket trip to the moon.

The program, Project Vanguard, was announced in 1955 by the Department of Defense. General Electric will build the first stage rocket propulsion system for the earth satellite. This satellite will be about the size of a basketball, and will be sent up a distance of 300 miles. According to a General Electric engineering expert, the next stepping stones would be 1000 miles up and 22,000 miles up, respectively. The second could possibly be manned, but the third one would definitely have a "crew."

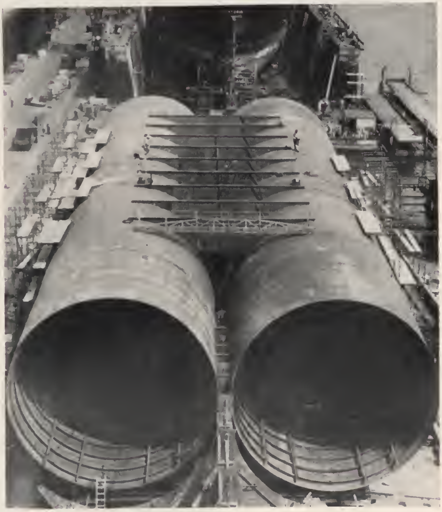
The 1957 satellite is to be launched via a multi-stage rocket to its 300 mile distance whereupon it would move at 18,000 miles per hour in an orbit about the earth approximately every 90 minutes. After a few days or a week the inevitable attraction to the earth will cause its orbit to become more and more elliptical and it will finally burn up in the atmosphere like a meteor.

The satellite will provide its own power by catching solar radiation.

Measuring instruments and an antenna will be on board to send signals to the earth.

The air drag on the orbit will report on outer atmosphere densities. More accurate measurements of intercontinental distances and the earth's equatorial radius will be possible. The satellite also will provide long term observations of solar ultraviolet radiation and data for studies of cosmic rays.

The third stage of the solar stepping stones, the space station 22,000 miles up, manned, would be used for television broadcasting, weather forecasting and, of course, military uses.



Twin sections of the new Baltimore Harbor Tunnel under the Patapsco River ready for towing to location.

FIRST TURBOPROP

(Continued from page 9)

In operation, the engines present some problems peculiar to turbines. Since the turbine is a high-speed device, it must be turned over at its idling speed before it will start. Fuel is injected into the flame tubes and ignited; the engine operation becoming self-sustaining when idling speed is reached. The turbine has very little braking effect itself; the propeller pitch cannot be reversed to provide braking as with piston engines.

Remembering the struggles to crank a Cub with both hands, the author was a bit dubious when invited to give a Viscount in Capital's shops a trial twist. Nonetheless, he ended up by pulling the prop through a quarter turn using pressure exerted by one finger

To provide braking on the ground, the propellers are turned to zero pitch and the engines are kept running, enabling the Viscount to land in 1,020 yards from a height of 50-feet. Even with the 10 to 1 speed reduc-

The Viscount Nacelle, showing turbine exhaust tube.

tion from engine to propeller, close engine speed synchronization is necessary. Synchronization is accomplished by a three-phase servo system. Each engine drives a three-phase alternator, from which any change in frequency compared to that of the "master" engine is used to control corrector motors on the "slave" engines. The pilot may select any engine as the "master;" the three "slaves" are then locked into the "master" within one revolution. The synchronizing equipment is inoperative during throttle changes, but regains control after the "master" engine has attained its new setting.

THE VISCOUNT

In years, the Viscount is a youngster, for it was born just after World War II. Structurally and aerodynamically the Viscount evolved from the post-war Viking, which had used some of the features of the Wellington bomber. When considering the turbine type engine, Vickers discarded the turbjet in favor of the more flexible and economical turboprop. In September of 1949 the Viscount "630" received its certificate of airworthiness, making it the first turboprop to be ready for service. In 1953, British European Airways inaugurated Viscount service with the model 701. In October of 1953,, B. E. A. entered a Viscount in the New Zealand Air Race; its time of 35 hours 47 minutes from London to Melbourne set a new point to point record, making the Viscount the winner by over nine hours. In 1954 Capital Airlines ordered its 700 series Viscounts; Capital now has nine of its order of 60.

Aside from its engines and silhouette the Viscount appears to be little different from other airliners. There are many features incorporated in the Viscount design to fully utilize the Dart engines. Like other aircraft the Viscount must fly at high altitues to realize its most economical operation. The usual cruising altitude is 23,000 to 26,000 feet, although the plane is equipped to fly between 18,000 and 30,000 feet. On the ground, the Dart engines require no ground checks; the Viscount may be aligned and braked before the engines are started. Since the turbine is essentially a constant-speed device, the engines cannot be used to control direction at low ground speeds. Steering on the ground is accomplished by the nosewheel with assistance from the braking system.

Since the Viscount is designed to operate at relatively high altitudes, its pressurization is high. Sealing of the hatches and doors is made sure by air-pressure operated rubber seals. The cabin windows are quite large (26" high) ellipses designed to provide maximum pressure for minimum stress. Pressure is maintained at a 6½ psi differential by three engine-driven Rootes type blowers, which can give any cabin altitude between 0 and 5280 feet.

VISCOUNT OPERATIONS

At this writing, Capital Airlines has had three Viscounts in operation for about nine months. They have found that the "break-even" load factor of the Viscount is about the same as that of a DC-4; it has proven itself for short-hauls.

Capital has a engine rotation plan whereby every engine is torn down every 1000 hours, with an impeller change every 700 hours. Since the engine is readily accessible and light, engine changes are accomplished with a minimum of lost flight time. The Viscounts in service have required no shakedown flights to find "bugs."

Up to this time, there has been only one grounding due to mechanical trouble: a starter unit failed in Chicago. This grounding may actually be attributed to lack of an understanding of English, or rather British, on the part of the Chicago ground crew. It seems that practically the entire Capital staff searched the Chicago field from top to bottom for "starters," completely bypassing a large and prominent stack of boxes labeled "electrical units." Finally a British-trained mechanic was able to unscramble the language barrier and free the grounded craft.

MECHELECIV wishes to acknowledge the kind assistance of Mr. L. L. Doty of Capital's Public Relations Office in furnishing Capital information and publications as well as manufacturer's and trade publications. All photographs are reprinted through courtesy of Capital Airlines.

Young engineers making news at *Western Electric*

Richard C. Shafer, B.S. in mechanical engineering at Lehigh, was one of 16 engineers assigned to one of Western Electric's toughest post-war projects — developing manufacturing techniques for mass-producing *(with great precision!)* the tiny but amazing transistors which are already causing a revolution in electronics.

Western Electric's primary job — which goes 'way back to 1882 — is to make good telephone equipment that helps Bell telephone companies provide good service. It's a very big job — and a very important one — which calls for the pooling of varied types of engineering skills.

New manufacturing processes and methods are constantly required to produce better telephones, better central office equipment, better wires and cables, new types of electronic equipment to keep pace with the nation's ever-growing need for more and better telephone service at low cost.

In addition to doing our job as manufacturing unit of the Bell Telephone System, Western Electric is busy producing many types of electronic equipment for the Armed Forces. Here again, young engineers of varied training are doing important work in connection with the manufacture of radar fire control systems, guided missile systems and special military communications systems.

Paul J. Gebhard, B.S. M.E. at the University of Maryland, was one of a team that helped develop Western's new electroforming process for coating steel telephone wire with copper, lead and brass in one continuous operation. His job: to develop conductor resistance-annealing equipment and electrolyte filtration and circulating systems.

Bobby L. Pettit (at right), an E.E. from Texas A. & M., is one of several hundred members of Western Electric's Field Engineering Force. These F.E.F. men can be found all over the world—working most closely with the Army, Navy and Air Force—advising on the installation, operation and maintenance of complex electronic equipment made by W.E.

SOAPBOX SHUFFLE

On May 3 and 4, the Engineers' Council will hold the second annual general election to provide Council representatives for next year's sophomore, junior, and senior classes. Two representatives will be elected for each class.

This is your opportunity to take a hand in the activities of the School of Engineering either by running for office or by supporting the candidate you feel will best represent your class. Anyone not on probation and who will not graduate prior to June 1957 is eligible to run in the election. Any student who wishes to establish himself or herself as a candidate must petition before April 16. To petition, a prospective candidate must obtain and file the short petition forms available at the MECHELECIV office in the Davis-Hodgkins House and in the Student Activities Office in the Student Union Annex.

The procedure of open elections for class representatives was initiated only last year. Partially due to the fact that it was new and engineering students were unfamiliar with the "who, when, and where" details, the results last year were somewhat disappointing. Candidates were few in number, campaign activity was not apparent at any time, and platforms were nonexistent. The voting was extremely light.

In the interest of enlivening this year's campaign, MECHELICIV is reserving space in the April issue for use of the candidates in explaining their platforms (or anything else they have to stand on). MECHELECIV will also print a picture for identification of any candidate willing to furnish the glossy print and pay for the photoengraving costs which will be $3.00 for a $2\frac{1}{8}$ x $2\frac{3}{4}$ cut. The deadline for April copy is March 20.

CAMPUS NEWS

DEAN MASON TO A.S.C.E. POST

Dr. Martin A. Mason, Dean of the School of Engineering, has been appointed chairman of the Committee on Research of the American Society of Civil Engineers.

The Dean explained that the Committee functions to coordinate research activities of the Society, reviews research progress and passes on expenditures from the society's research funds.

THETA TAU

The pale and painful looks on the faces of the members of Theta Tau are the results of the new programs inaugurated this year.

The "blood bank program" is the cause of the pale faces. This program, requiring the donation of 10 pints of blood a year, guarantees that actives, honoraries, and alumni (for a period of 1 year after graduation), and their families will receive all the blood that they may require in an emergency.

The painful looks are the after-effects of the fraternity's participation in the University's intramural sports program.

On February 10th and 11th, Gamma Beta chapter pledged the following men: Roy D. Brooks, Bob Donald, Dan Dreyfus, Paul Goozh, Charles Hunter, Arthur Koski, David Lewis, John Manning, Morrow Moore, Vincent Rider, Norman Street, Ray Sullivan, Earl Swann, and Ado Valge. These men, upon successful completion of their pledge duties will be initiated into the fraternity and honored at the spring Ball and Banquet on March 17 at the Occidental Restaurant. *All alumni are reminded and invited to the affair.*

AIEE - IRE

At the annual banquet of the Washington Section of the Institute of Radio Engineers held on Feb. 11th in the Presidential Ballroom of the Hotel Statler, student awards were presented to Mr. Donald B. Keever and Mr. Harry K. Morlock. The winning of these awards was based on a competitive exam given to all graduating seniors in the G. W. U. Student Chapter of IRE & AIEE. Mr. Donald B. Keever received the top institute award consisting of a year's membership in the National IRE, a large dictionary, a savings bond, and a letter of commendation from the Washington section of IRE. Mr. Harry K. Morlock received the second place award consisting of a defense bond and a letter of commendation from the Washington section of IRE. In addition Mr. and Mrs. Keever and Mr. Morlock were special guests of the Washington section at the annual banquet. These awards were presented by Dr. Warren R. Ferris, chairman of the Student Affairs Committee of the Washington Section of IRE.

SCHOLARSHIP ANNOUNCED

The university's engineering scholarship for the spring semester 1956 has been awarded to Stephen A. Thau, son of Mr. and Mrs. Theodore L. Thau, of Washington, D.C.

Stephen, who graduated from Anacostia High School in January, ranked second in his class, according to Anacostia officials. At Anacostia he maintained a straight A average for five semesters, and was selected salutatorian of his class.

A. S. C. E.

In its January meeting, the student branch of the A. S. C. E. held its election of officers for this year. Richard Rumke was elected as president, with Joseph Scott as vice-president. Daniel Dreyfus will fill the post of treasurer, while Walter Evans will serve as corresponding secretary, and Richard Haefs as recording secretary.

A view of Tompkins Hall, taken from 23rd & G Sts. The final height of the building is indicated by the fourth story forms.

Slipstick Slapstick

A Scotsman was out golfing one day and his caddy was faithfully following him, carrying the very heavy golf bag, running after lost balls, and in short, doing everything expected of a good caddy. After finishing the eighteenth hole, the Scotsman turned to the caddy and asked him what the charge was. The caddy replied that there was no set fee, and the golfers paid what they wanted to, so the Scotsman suggested that the caddy settle for the change in his pocket and the caddy agreed. The change turned out to be three bright pennies.

"Y' know," said the caddy, "these three pennies tell me a lot about you."

What do they tell you?"

"Well, the first penny tells me that you're a Scotsman."

"That's right."

"And the second penny tells me that you're a bachelor."

"That I am."

"And the third penny tells me that your father was a bachelor too."

* * *

Little Boy: "We've got a new baby down at our house."

Neighbor: "How nice. Did the stork bring him?"

Little Boy: "Hell no, he developed from a unicellular amoeba.

* * *

Give an athlete an inch and he'll take a foot - - but let him take it. Who wants athlete's foot?

* * *

The girl on the bus was reading an article on birth and death statistics. Suddenly she turned to a gentleman sitting beside her and said, "Do you know that every time I breathe, a man dies?"

"Very interesting," the gentleman returned. "Ever tried sen-sen?"

A young engineer took his girl to the open air opera one beautiful warm evening. During the first act he found it necessary to excuse himself. He asked the usher where the men's room might be.

"Turn left and walk down to the big oak tree and there it is."

The young engineer did as he was told and in due time returned to his seat.

"Is the second act over yet?" he asked the girl.

"You ought to know," she replied, "you were in it."

* * *

Overheard in a parked car near Strong Hall: "Slow down Columbus, you've discovered enough for tonight."

* * *

A man was accustomed to walking through a rural cemetery on his way home since it was a short cut. One night he started through unaware that a new grave, seven feet deep had been dug in his path. He tumbled into the grave. For almost an hour he struggled to get out but finally gave up and decided to settle down for the night.

A gangly farmer, out on a possum hunt, came walking through the cemetery. He, too, fell into the grave. He began a desperate attempt to get out, unaware that there was anyone else in the grave.

The first man listened to him silently for a few minutes, and then reached over in the pitch darkness and laid a hand on his shoulder.

"You can't get out of here," he said.

But that farmer did!

A L U M V I E W S

PRESIDENT'S MESSAGE

By WARREN C. CRUMP

President, Engineers' Alumni Association

Since the arrival of your last issue of the MECHELECIV, many events have taken place that have marked this year as one of the most important in the history of the Engineer Alumni Association.

By this time you have been contacted, either through the Association or the General Alumni Association's Annual Alumni Fund, concerning the Equipment Fund of the Tompkins Hall of Engineering. Although we have much work to do in reaching our goals for this fund, I am encouraged by the universal support that Engineer graduates are demonstrating in behalf of their Alma Mater.

Furthermore, the time and effort being employed by the key workers in this campaign is tremendously inspiring and is a tribute to the caliber of men who have graduated from the School of Engineering. The thanks of the Engineer Alumni Association officers can hardly measure the sacrifice these fellow alumni are making.

Another encouraging development has been the publication of the ENGINEER ALUMNI DIRECTORY which is now being mailed to all alumni of the School of Engineering. Based upon the thorough preparation of Merwyn W. McKnight, Sr., the Association and the Office of Alumni Relations have been able to prepare an attractive and valuable addition to the desk of each of us. Our thanks to the University for financing this publication.

All is not past, of course. Preparations are now being made for the annual meeting of the Engineer Alumni Association, this to be either a luncheon or dinner. More information on this function will follow in later issues of MECHELECIV.

THANKS!

MECHELICIV wishes to thank the following alumni who have subscribed since the November issue. Additional subscriptions will be acknowledged on this page as they are received.

AARON, HENRY .... District of Columbia
ALLEN, JOHN .... District of Columbia
APPEL, CHARLES A. .... New York
ARMSTRONG, WOODROW .... Virginia
BABIN, ROBERT .... Massachusetts
BAILER, EDMUND .... Maryland
BARBUTA, ANTHONY .... District of Columbia
BECRAFT, CLARENCE .... Maryland
BEERS, JOHN .... Maryland
BENNETT, VERCILLE .... Virginia
BERDICK, MURRAY .... New York
BONDY, MICHAEL .... New York
BOYD, J. R. .... Maryland
BOYDEN, JOHN .... District of Columbia
BRADY, DIRK .... New York
BRAUGH, FRANK .... California
BRAUNER, RALPH .... District of Columbia
BREAZEALE, JAMES .... District of Columbia
BROWN, CHRISTOPHER .... Michigan
BROWN, LAWRENCE .... Pennsylvania
BRUCE, CLARENCE .... Florida
BRUSH, CHARLES .... Maryland
CAMPBELL, DONALD .... Connecticut
CHEW, BERNARD .... California
CIOFFI, JOHN .... New York
COLANGELO, JAMES .... Virginia
COLE, HOWARD .... District of Columbia
COLE, WALTER .... Ohio
COLLINS, SAMUEL .... District of Columbia
COREY, GEORGE .... New York
COSMAN, ALVIN .... District of Columbia
COULOMBE, RAYMOND .... Maryland
CRAIG, DWIN .... Virginia
CRUMMETT, HARVEY .... Bogota, Colombia
CUSTARD, ROBERT .... Virgina
DARLING, H. V. .... Virginia
DAVIS, WATSON .... District of Columbia
DOUGLASS, PAUL .... Maryland
ENGEN, GILBERT .... District of Columbia
EPPERSON, WILLIAM .... New York
FLURIE, EUGENE .... Maryland
FREE, WALTER .... New York
FULLER, RUSSELL .... California
GARDNER, ROBERT .... District of Columbia
GARMAN, GEORGE .... Maryland
GEIST, JOHN .... Virginia
GIRALDI, ALMERIGO .... Maryland
GLESSNER, JOHN .... Pennsylvania
GRIFFIN, CHARLES .... New Jersey
GRADY, JOSEPH .... Maryland
HAFFORD, THOMAS .... New York
HAND, ELLSWORTH .... District of Columbia
HARRIS, VIRGIL .... Maryland
HARRIS, WILLIAM .... Wisconsin
HARRISON, ROBERT .... Illinois
HAYES, JOE .... Virginia
HEKIMIAN, NORRIS .... Maryland
HELD, JOHN .... District of Columbia
HELFRICH, KENNETH .... Maryland
HELVESTINE, ALBERT .... District of Columbia
HERMACH,, FRANCIS .... Maryland
HESS, LAURIE .... District of Columbia
HONG YEE, RICHARD .... District of Columbia

(Please turn to page 28)

ALUMNI NOTES

By the Alumni

E. F. Bailer (BCE '51; Theta Tau, Sigma Chi) is employed by the Outdoor Lighting Department of General Electric as Field Product Specialist for the Washington Area.

Kingsley Brown (BME '55; Theta Tau, Sigma Tau) and his wife are working at the Central Engineering Division of the Chrysler Corporation. He is studying for a MS in Automotive Engineering at the Chrysler Institute of Engineering.

Captain Charles E. Brush (BME '30) was Chief of the Naval Engineering Section, First Coast Guard District, Boston, Mass. He will be Yard Planning Officer, U. S. Coast Guard Yard. Curtis Bay, Maryland.

J. M. Colangelo (BCE '54; Theta Tau) was promoted to Bridge Designer for Michael Baker, Jr., Consulting Engineers. He has a home in Springfield. Virginia, and has a daughter. 14 months old.

R. A. Coulombe (BME '48) has recently become Senior Design Engineer of the Shaft Seal Department, Metal Products Division, Koppers Company, Baltimore, Maryland. His family includes: his wife, Eleanor; his daughter, Michelle (12); and his son, Bruce (13).

MECHELICIV thanks those alumni who have sent the Alumview coupon to us. We are greatly indebted to those who have written us letters. However. there is still not as much news from the alumni as we need. This column prints your news and views. The column relies upon your support. Without it the column cannot exist. So, let us know about you, what you and your family are doing. A few words on the coupon below will help.

Alumviews prints anything you, the alumni, wish. It is your column: about you, for you, and by you.

A. Giraldi (BCE '55; Sigma Tau, Theta Tau) is employed by Beall and LeMay, Structural Engineers, Washington, D. C.

William Griffin (BCE '49; Pi Kappa Alpha) has been working with Stewart C. Barnett, Consulting Engineer in Camden, New Jersey. He was recently appointed to a four-year term on the ASCE National Committee on Employment Conditions.

Henry E. Hutto (BSME '49; Sigma Tau) has been Plant Engineer for the Misco Precision Casting Company for the past three years.

Glenn R. Lawrence (BSCE '10) is a Structural Engineer for the Wellman Engineering Company, Cleveland, Ohio. He has completed forty years of service with this company.

Jerome B. Rockowitz (BCE '50) has been employed by Convair as a Patent Agent since 1953.

William R. Sutherland (BCE '49, MSCE '51 from MIT; Sigma Tau, Theta Tau) is the vice president and manager of the Houston, Texas, branch of the Griffin Wellpoint Corporation.

Raymond I. Tompkins (BS in EE '32) left the US Patent Office in 1951 and went to Long Island, New York, as a patent attorney for the Office of Naval Research. He returned to Washington in 1954 to head a patent branch for the Navy's Bureau of Aeronautics. Recently, he was elected Chapter Advisor of Acacia Fraternity at George Washington University.

TO: ALUMNI EDITOR
Mecheleciv Hagazine
The Davis-Hodgkins House
The George Washington University
Washington 6, D. C.

From: ------------------------------

Here are a few comments for ALUMVIEWS on where I'm working, what I'm doing and news of my family.

Degree and Date ------------------------------ **Fraternity** ------------------------------

Thanks!

(Continued from page 26)

HOWARD, FRANK	New York
HUTTO, HENRY	Michigan.
HUGHES, EDMOND	Pearl Harbor, T.H.
HYDE, LAWRENCE	District of Columbia
JONES, IRA	Ohio
JUNCAL, RAYMOND	District of Columbia
KEEGAN, HARRY	District of Columbia
KELLEY, JAMES	District of Columbia
KERLIN, WILLIAM	Maryland
KINCAID, JAMES	New York
LAHNA, ADOLPH	North Carolina
KLOPFER,, LEWIS	District of Columbia
LAWRENCE, GLENN	Ohio
LECRAW, JOHN	New York
LICHTENBERG, ARTHUR	New York
LIPPITT, EDWARD	West Va.
LITTLE, ROBERT	District of Columbia
LINK, J. H.	District of Columbia
LOOSE, WINFIELD	Pennsylvania
LYNCH, RAYMOND	Virginia
MACHEN, WILLIAM	Maryland
MARSHALL, FRANK	Maryland
MARTIN, JAMES	California
McCLURE, BIRTHEL	Illinois
McCOBBIN, JOHN	New Jersey
McCULLOUGH, ROBERT	South Carolina
McKEE, T. R.	Maryland
MINTE, FRED	California
MEISSNER, PAUL	District of Columbia
MINTZ, FRED	California
MOHL, CASPAR	California
MORGAN, EDGAR	District of Columbia
MOTZ, C. A.	California
NIEDERSTRASSER, R. E.	Virginia
OAKLEY, LAWRENCE	New Jersey
PARROTT, WILLIAM	Virginia
PARSONS, JOHN	District of Columbia
PENCE, VIRGIL	Maryland
PETERITAS, RAY	Pennsylvania
PETROLINO, JAMES	Georgia
PINDELL, WILLIAM	District of Columbia
PRENTISS, SPENCER	Oklahoma
PURCHASE, ALBERT	Vermont
PYNN, GEORGE	New York
REED, WILLIAM	Maryland
REZNEK, JOEL	District of Columbia
ROBB, JAMES	North Carolina
ROCATTI, EDGAR	New Jersey
ROCKOWITZ, JEROME	California
ROEDER, CARL	Maryland
ROESER, PETER	Maryland
ROESER, WILLIAM	Maryland
SCHMITT, EDWIN	Maryland
SHEA, ROBERT	Virginia
SHERARD, WILLIAM	Virginia
SHEPHERD, WARREN	Pennsylvania
SHIMKUS, DANIEL	Massachusetts
SIGLER, PERCY	District of Columbia
SMITH, LLOYD	Minnesota
SONNABEND, JOEL	Maryland
STEPHENSON, EARL	New York
SUTHERLAND, EARL	District of Columbia
SUTHERLAND, WILLIAM	Texas
THOMAS, ALONZO	Maryland
THOMPSON, RALPH	Virginia
TINKELENBERT, ALBERT	District of Columbia
TOMPKINS, RAYMOND	Virginia
TURNER, OTIS	Virginia
VAN SICKLER, ROBERT	Texas
VEST, STANLEY	Virginia
VICORY, HOWARD	New York
WALTER, LAWRENCE	Maryland
WARD, WILLIAM	Michigan
WIDMAN, JOSEPH	District of Columbia
WILLIAMS, FRANK	Virginia
WILLIAMSON, CLIFTON	Pennsylvania
WITKOWSKI, WALTER	Maryland
WOOD, RICHARD	Virginia
YATES, WILLIAM	Virginia

Finding Your Notch -- For Free !

By Bobby Holland

You have all read many studies on the number of jobs available for engineers, the high salaries waiting for slip-stick specialists after graduation, the big companies just dying for the opportunity to furnish round-trip transportation for a visit, and the many inducements offered to anyone who will take a job with this company or that.

We all know or at least have read many times that the average salary for a B. S. is $376 to $400 a month, the average for a M.S. is $426 to $450 a month and the average for a PhD is $576 to $600 a month (granted, we needn't bother to a great extent with the last two named categories). Is there anything we don't know about this question of jobs? Yes there are probably quite a few things, and if you read on you may pick up little grains of information from the qualitative rather than the quantitative view point.

What kind of engineer is most in demand today? The electrical engineer today has the best chance of getting the job he wants at a better salary than his fellows because of the increasing need for men trained to understand communications and the new computing devices. The civils are the least sought after, at least by college recruiters. Only eleven of the companies visiting the University during the months of February and March looked for CE's. ME's stand in the middle, receiving a much larger proportion of recruiters than CE's and less than EE's. Following the trend, Universities and Colleges are generally graduating more EE's than other types of engineers now.

Perhaps one of the most sought after engineers today is the Industrial Engineer — just a fancy name for a man with both technical and business training. Companies are visiting colleges more and more in the hope of picking up good junior executives rather than the standard research worker or technician.

Although the junior executive position does not necessarily include sales, this is as good a place as any to include a few lines of that general phase of the whole picture. Just as companies are coming to realize the necessity of having technically trained executives in the complex age in which we live, so they are also beginning to realize the need for salesmen who can understand the technical complexities of what they are selling and, most important of all, translate the jargon of mechanization into the plain English of the man on the street.

You have read many times that there are two jobs open for every engineer who graduates, so the competition is more on the part of the companies than of the job seekers. The other, less publicized side of the picture is that there are always some companies preferred by you. There are very few of you so completely unprejudiced or so naive that you have not even bothered to think about your future. Because of this, of course, there are always a few firms for which the competition is a little harder. On what qualities do these companies judge? How do they decide which of the many eligible candidates they want as an employee?

This is what Pat Coulter in the Student Placement Office says: First are grades - - no matter how many people tell you that grades are unimportant - - that companies want well-rounded men, not quiz-kids - - those little A's, B's, and C's on your semesterly report are going to make a lot of difference where the competition is tough. Maturity also is a factor which is weighed heavily, although there is little you can do about it except be or not be, however, if you are not, you might make great strides by thinking for yourself. Draft status, another major factor is completely out of your hands. Only the U. S. Government can give you a 4F rating if you have not already served your sentence. When the final narrowing down comes they even consider such factors as your marital situation: where your wife comes from, and if it's far from the company's location, will she be happy there? For public relations and sales jobs, personality and appearance weigh heavily.

Most companies today offer some form of graduates training as an extra inducement. Some, such as Chrysler, emphasize the schooling aspect, and you are hired to go to school and then work for the company. Other companies have arrangements with local schools and universities whereby their employees may attend classes and receive Master's degrees.

Small companies are generally preferable from the standpoint of rapid advancement, and for this reason many of you will prefer to work for them. The aircraft companies, on the other hand, who probably need the most engineers, have very bad reputations with the college student in general for their alleged habit of hiring and firing at will. These companies are beginning to realize how detrimental to them such policies have been and are taking steps to stabilize the industry. They are now offering more security of job tenure by finding a balance between erratic government contracts which offer a lot of highly paid jobs at one moment and nothing the next and the more stable civilian contracts.

Like every other commodity on the market, labor is only in demand when it is scarce and right now technically trained young men are scarce. You, the engineers, are having a once in a life-time opportunity. Are you taking advantage of it? A display and pamphlets on various companies are in the Davis-Hodgkins house—study them. Each senior received a mimeographed interview sheet during registrtion, now all you have to do is sign up and be interviewed in the Davis-Hodgkins House.

About 80 companies visit the University during the year and only the exceptionally interested student visits as many as 20 of them. A student visiting 20 will receive anywhere from 8 to 12 offers. A student visiting as many as 40 would probably receive 20 or more offers. You may think you know who you want to work for but don't you owe it to yourself to see what is offered by the majority, or at least half of the companies.

The Civilized Atom

(*Continued from page* 15)

the raw material, is much like the U238 process, and is being explored by the United States, the Soviet Union, Great Britain, and France. Here, the thorium is converted into a fissile product by neutron capture from the U235 seed and by reactions not dissimilar to those in the case of U238. Both of these breeding systems are in early stages of development.

Reactors presently being built promise to be powerful tools, in medical and industrial research particularly.

The first reactor specifically designed for medical research is now under construction. This reactor, being built by North American Aviation as a part of the medical center of the University of California at Los Angeles, is expected to be completed this summer. One of its functions will be related to the treatment of cancers—not only easily accessible ones, but also those which are difficult or impossible to treat by other means. The former kind will be treated by gamma radiation, while the latter are to be attacked by the indirect method of thermal neutron bombardment.

The treatment of cancerous tissues by gamma rays is the simpler of the two processes, but it has the disadvantages that it cannot be used against deep-lying lesions without harming the healthy tissues which cover them. Gamma rays are themselves similiar to x-rays, except that they are more potent, and the method of treatment is similar to x-ray therapy.

The thermal neutron process is somewhat more complicated. A boron-bearing solution is introduced into the malignant area, where it is absorbed easily by diseased cells but hardly at all by normal ones. The area is then bombarded with thermal neutrons from a reactor; these react with the impregnated boron to release alpha particles which, like gamma rays, are cell-killers. Since alpha particles can penetrate only short distances into body tissue, they destroy the cells which have absorbed the boron solution, but cannot reach the healthy ones which have not. Thus, cancers which were formerly untreatable may soon be dealt with by this new method.

The U. C. L. A. reactor is so designed that either the gamma radiation or the thermal neutrons may be used separately. Its fuel is liquid—a solution of uranyl sulfate—and is highly enriched; that is, it contains a high concentration of U235. Current plans include using this reactor as a source of short-lived radioisotopes for use in biological research, another field that owes much to the development of reactor techniques. The thought that this humanitarian device is the child of the atomic bomb is as incredible as it is true.

While we may expect important developments in medicine when the U. C. L. A. reactor goes into operation, even more progress will probably be made by industrial users, because of the vast financial resources of

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The Civilized Atom

(*Continued from page* 30)

American industry. Business is always interested in spending money to make money, and if its leaders can be convinced that atomic energy is a sound investment, there is no limit to what can be done. The idea of using nuclear reactors to generate electrical power is not new. In fact, thousands of residents of New York state are already using power generated by a 10,000 kilowatt General Electric nuclear power reactor. Another power reactor, this one constructed by North American Aviation, will soon service several communities in California.

In addition to the electric power they supply, reactors are of interest to industry because of their use in numerous specialized situations. Foremost among these are sterilization of foods and drugs, inspection of the structure of metals, plastics, ceramics, and other materials, and the study of machine operation. Studies in these fields will be carried out using the new industrial research reactor of the Armour Research Foundation at Chicago. Built at a cost of about a half a million dollars, this reactor, like the one at U. C. L. A., uses the liquid fuel and is a source of gamma radiation and neutrons.

The foregoing discussion has pointed out the advances that have been made in recent months. But the problems still without solution are by no means insignificant. There are problems of design, development, testing, and redesign—problems on whose solution depends the rate at which we are to progress into what we confidently call the atomic age.

The most obvious problem is cost. In medicine and basic research we tend to make cost a minor consideration, because the value derived is worth almost any price; but in industry, where other methods often exist, cost is and must be considered.

There is the question of safety. Those who work with these new nuclear "machines" must be protected against all possible dangers. There has never been, in this country, a report of a reactor's "running away", but that possibility exists and must be taken into consideration in the design of each new reactor.

While the United States has progressed at an impressive rate in the field of atomic energy and its peaceful applications, there are formidable problems yet to be solved. For the engineer—for every kind of engineer—these problems present a challenge the like of which has never before been known. The challenge will not go unanswered.

Boeing engineers find rewarding jobs in Wichita, Seattle

This model of a supersonic airplane design was dropped at extreme altitude from a B-47 Stratojet. Telemetered data revealed the characteristics of its supersonic flight to destruction at the earth's surface. This is just one example of Boeing-Wichita's continuing development of advanced aircraft and associated system components.

At Wichita research and development programs are expanding rapidly. Laboratory space has been quadrupled and many other new engineering facilities have been added to keep pace with increasing emphasis on technical development. At both of the company's plants, Seattle and Wichita, the increased scope and magnitude of this development effort is creating additional and excellent career opportunities for all types of engineers.

This means that if you are an electrical engineer, a mechanical engineer, a civil or an aeronautical engineer or a physicist or mathematician with an advanced degree, there is a real challenge for you in one of Boeing's design research or production engineering programs. You would work in a tight-knit team where there is plenty of room for self-expression and recognition.

Boeing engineers are working now on future airplanes and missiles that will maintain the standard of technical superiority established by the B-47 medium bomber, the B-52 intercontinental bomber, the BOMARC IM-99 pilotless interceptor, the 707 jet transport and the KC-135 jet tanker-transport.

Recognition of professional growth is coupled with career stability at Boeing — twice as many engineers are now employed by the company as at the peak of World War II. They enjoy a most liberal retirement plan. How would *you* like a satisfying, creative job with the pick of the engineering profession? There may be one waiting for you in the progressive communities of Wichita or Seattle.

For further Boeing career information consult your Placement Office or write to either:

JOHN C. SANDERS, Staff Engineer—Personnel
Boeing Airplane Company, Seattle 14, Wash.

RAYMOND J. B. HOFFMAN, Admin. Engineer
Boeing Airplane Company, Wichita, Kansas

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Hi-Fi Photography

(*Continued from page* 13)

Many extremely interesting extensions of the application of the basic device described in this article exist in the fields of graphic arts and radiology. Unfortunately, space does not permit their inclusion.

The basic principle of the LogEtronic printer is a radical departure from that of all other contemporary printers, and the results which have been obtained to date eloquently demonstrate the need for such departure.

Those alumni who attended GWU in the postwar years of '46, '47, and '48 may remember Dwin R. Craig as being an extremely busy individual at that time. As a married veteran with an urge to get his degree as soon as possible, he carried the maximum allowable number of hours for three years and graduated with a BSE with a Physics Option in '48. He was also a member of Theta Tau, Sigma Pi Sigma, and member-at-large of the Engineers' Council. Apparently these activities didn't keep him fully occupied for he also held down the tenor sax chair with "The Alaskans," a well-known dance band which

played for the Engineers' Ball in '47 and '48.

Today Mr. Craig is still a busy man, trying to keep ahead of the burgeoning activity of LogEtronics Incorporated of 500 East Monroe Avenue, Alexandria, Va. He is Vice President and Technical Director of LogEtronics, Inc., a corporation set up to manufacture and market a device known as the LogEtronic Contact Printer which was invented by Mr. Craig and about which this article was written. Apparently, the message to be had in English Composition and Engineering Report Writing courses got through to Mr. Craig. Instead of a writing assignment, this article turned out to be a pleasant job of editorial compilation from several of his well-written papers on the device.

It's interesting to note that although this is a comparatively simple device, another of those "why-couldn't-I-have-thought-of-that" things, Mr. Craig maintains that working out the details of the construction of the first model and coping with problems encountered in improving subsequent models required application of knowledge and skill acquired in a wide variety of classes here at GWU.

From The Editor's Notebook

Without resorting to trite statements about increase in size *MECHELECIV* again boasts a four page jump in size to thirty-six pages, the largest ever. Last December's thirty-two pages brought moans and groans from the circulation staff, who addressed, sorted and carried 2300 copies out to be mailed.

While thinking of a prospective faculty member to tap for this month's faculty page, we remembered the precise and meticulous lectures of *Prof. Cruickshanks* in thermodynamics class a few years back. When approached to write on his favorite editorial subject, the senior member of G. W.'s engineering faculty showed the same enthusiasm that had appeared along with the Otto and Diesel cycles in M. E. 112. Prof. Cruickshanks has devoted most of his life to the engineering school, and the problems of various students through the years. Only last year he received a special plaque citing him for his meritorious service in the interest of the engineering student at G. W.

Of major interest to the staff of *MECHELECIV* was the new addition to the *Rider* family: 7 lb. Jan Marie born January 11th. The first official notice that yours truly, the editor, received was on January 12, when Vince proceeded to hand out cigars wrapped in cellophane saying "It's a girl." Vince say y. t. seven times that day,, result: seven cigars. To the usual engineering students, this would pose no problem, but to y. t. who is a bachelor and doesn't smoke it presented a major hurdle to palm off seven well-wishers of new parenthood; even Jane Mc Mullan, the Dean's secretary, got offered one.

After delving into all past, present and projected future financial records, *Jerry Renton* came up with the interesting fact that we could afford to publish *MECHELECIV*. Jerry is now acting as a sort of liason agent between the business staff's cold figures and the editorial staff's wishes to toss in more engravings and fancier printing.

The other day, *At Barwick* wandered in and slipped a bill for photo supplies in the Business Manager's box. At then glanced out the window and pondered over the angle frmo which to take this month's shot of Tompkins Hall. We are in agreement with At in that the building is sort of a dominating sight from the windows of the *MECHELECIV* office on 22nd Street..

With the publication of this issue, our mailing should be almost straightened out. The circulation staff has been working steadily on making new and revising old addressograph plates for both the student and alumni lists. Hats off to these boys for a splendid job.

IN OUR NEXT ISSUE: *Dr. Walters* will give an insight into the role of the engineer in society, with his contribution to the faculty page. *Theresa Koontz* will point up a little-known segment of engineering; the females in our ranks.

"Atom Apple," a 225-foot sphere of steel plates welded into virtually one piece.

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ENGINEERING DESIGN COURSE provides a background in materials, methods, and manufacturing processes, with instruction tailored to improve the engineer's design ability.

You may also take any of the numerous Specialized Technical and Departmental Courses that are continually offered.

(3) Advanced Engineering Program

To select and train technical leaders, this program combines extensive class and home assignments, with a 36-hour work week in association with Company technical leaders. The program is rigorous but the hard work pays off, for since its founding in 1923, 75% of its graduates have become engineering specialists and managers. Selection for the program requires either a Masters Degree or graduation from the Advanced Technical Course.

(4) Creative Engineering Program

This course is designed to help you make maximum use of your imagination and resourcefulness in solving problems and contributing new ideas. The number of patents registered by graduates of this program is almost double that of other engineers in General Electric. The one-year graduate-level Company course presents the latest techniques in creative engineering. Problems are worked on an individual basis or team basis. Complete facilities are available for construction of models and prototypes needed to demonstrate and develop any ideas.

For complete information write Mr. W. S. Hill, Engineering Services, Bldg. 36, General Electric Company, Schenectady 5, New York.

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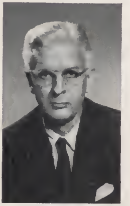

G.E.'s CLARENCE H. LINDER, *Vice President—Engineering, defines the challenge of technology.*

ENGINEERS IN INDUSTRY

Industrial progress hinges on the engineers' ability to apply amazingly complex technology to the problem of creating new goods and services. It is vital that the engineer at G.E. be given every opportunity for self-development in his chosen field, and so the far-reaching educational programs described on this page are designed to satisfy three specific needs.

The Team Approach

The team approach to complex technical projects is extremely important in industry today. It brings together competent men with a wide variety of training and experience to blend their abilities in the solution of problems. To be prepared to work as a member of a team, the engineer must develop appreciation and understanding of the work and contribution of the other members. Recognition of this need is the basis of teaching philosophy all through the programs.

Importance of Supporting Sciences

Many of the problems facing engineers in modern industry are not found in the principal engineering sciences, but have shifted into areas which have been thought of as supporting sciences. An engineer working principally in aerodynamics, for example, may find the main roadblocks in his work are the limitations of the materials which are available. By working closely with experts in the field, the engineer must in fact influence the development of new and better materials.

Broad Technical Backgrounds

The solid core of industry's engineering effort is a body of men thoroughly grounded in the fundamentals of basic science. With the explosive increase in technology, the engineer and scientist need to keep abreast of all allied areas. G-E advanced-study programs give this opportunity.